was discussed by Gregor A. Kurella, C. F. Hazelwood, Harry Grundfest, Ake P. Vallbo, Raja N. Khuri, Eberhard Frömter, and Berton C. Pressman. Gregor A. Kurella's work on the alga *Nitella* deals with potential gradients between the different parts of the cell, first across the cellulose pectinic wall, then through the cytoplasm, and finally into the central vacuole. Microelectrodes filled with antimony or made of *p*H-sensitive glass are used to measure the *p*H of the cell sap of *Nitella flexilis*. Kurella also described his method of microinjection into the central vacuole. He measured the chloride and potassium activity in the cell sap through a microfistula.

Harry Grundfest covered the dynamics of the cell membrane as an electrochemical system. Every theory of a biological membrane must consider these membranes to be heterogeneous systems which are highly permselective and very thin. Grundfest also discussed the mechanisms of activation and inactivation in biological membranes.

Raja N. Khuri presented work dealing with the determination of Na^+, K^+, and *p*H in single proximal tubules of *Necturus* and rat kidneys with microelectrodes. He reported that, in both species, the activity of Na^+ in the intraluminal fluid was the same as in the blood.

The use of microelectrodes in studies of cytoplasmic properties was discussed by Otto Schanne, P. G. Kostyuk, J. A. M. Hinke, Frank W. Orme, and William J. Whalen. Schanne discussed the two methods used in the measurement of cytoplasmic resistivity. The resistance of a micropipette is a function of the resistivity of the solution in which the tip is immersed. The resistance change is characteristic for a given electrode and can be recorded as a calibration curve. Measurements with calibrated micropipettes are subject to the same conditions as measurements of membrane potential. The ionic specificity and *p*H sensitivity of micropipettes must be carefully controlled in these measurements.

P. G. Kostyuk described a technique for the measurement of hydrogen, sodium, and potassium ions in striated muscle fibers and nerve cells with sealed glass microelectrodes. It was concluded that activity coefficients obtained with ion selective microelectrodes cannot give the true physical nature of the processes of interaction of ions with the structural components of protoplasm. Consequently, the technique cannot be used to determine the degree to which ions are bound.

J. A. M. Hinke has used closed-tipped glass microelectrodes with diameters up to 30 microns and has confined his studies to large cells. From his work with isolated barnacle muscle fibers (*Balanus nubilus*), he concludes that significant quantities of cellular monovalent cations are not free in solution. Moreover, sodium ions and not potassium ions are preferred by intracellular binding sites.

Frank W. Orme described a method of preparing calcium ion and chloride ion microelectrodes. The procedure consists of filling the tips of micropipettes with a liquid organic ion exchanger. Electrodes give near Nernstian response to calcium down to 10^{-5} molar. The chloride electrodes have much lower electrical resistances and are fast responding.

Whalen reported a very fast responding (less than 1 second) pO_2 microelectrode having a tip diameter of about 1 micron, which is not affected by stirring. Such electrodes have been successfully used in studies dealing with cell respiration.

Microinjection techniques were discussed by T. K. Chowdhury and Louis J. DeFelice. Chowdhury presented a new method for the microinjection of electrolytes and nonelectrolytes into a microlocus within an individual cell or tissue. The method utilizes a high-frequency axial vibration imposed on a micropipette filled with the desired solution.

The conference was sponsored by Corning Glass Works with the cooperation of the University of Sherbrooke. Abstracts of papers can be obtained gratis from Corning Glass Works, Technical Information Center, Sullivan Park, Corning, New York 14830.

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Calendar of Events

Courses

Application of Computers and Systems Modeling to the Solution of Power System Problems, University of Toronto, 6–17 May. The course is intended for power system engineers, system planners, applied mathematicians, and educators. It is anticipated that this course will (i) familiarize the participants with the organization, algorithms, programming, and simulation techniques associated with the digital computer; (ii) provide the required background of numerical and mathematical methods applicable to the use of digital equipment for active control and problem solving; (iii) allow evaluation of system models and computational economy when applied to the solution of system transient, planning, control, and economic problems. Fee: $350. (Division of Extension, Business and Professional Courses, University of Toronto, 84 Queen's Park, Toronto 5, Ontario, Canada)

Composite Materials: Fundamentals and Utilization, University of California, 14–19 June. The course will cover advances in composite materials and structures technology and will explore the potential structural applications of composites. Aspects of research and technology to be discussed include micro and macro mechanisms, nonlinear elasticity, structural design, anisotropy of fracture and strength, experimental techniques employed in fracture studies and directional solidified metals and ceramics. Fee: $260. (Engineering Extension, University of California, 2223 Fulton St., Berkeley 94720)

Grants and Fellowships

Medical Research. The Life Insurance Medical Research Fund has announced grants-in-aid of medical research to become effective 1 July 1969. These grants are made to nonprofit institutions for support of basic research in physiology, biochemistry, and other fields related to medicine. *Deadline for receipt of applications: 15 September.*

The Fund also offers medical scientist fellowships to medical students willing to prepare for careers in teaching and research by securing both the M.D., and the Ph.D. or its equivalent. The fellowships offer a maximum of 6 years of aid; fellowships may be activated at various stages of the M.D.–Ph.D. training. Each school of medicine is invited to make two nominations for aid to begin 1 July 1969. *Deadline for receipt of applications: 15 October.* (Scientific Director, Life Insurance Medical Research Fund, 1030 East Lancaster Ave., Rosemont, Pa. 19010)

Oncology. The Cancer Section of the Oklahoma Medical Research Foundation is offering fellowships in oncology to interested persons holding either the M.D. or the Ph.D. degree. Clinical studies include experimental therapy, clinical pharmacology of chemotherapeutic agents, studies of the natural history, biology, and biochemistry of human cancer. Programs can be elected leading either to the practice of clinical oncology or to clinical research in oncology. Nonclinical studies include experimental therapy of rodent tumors, pharmacology and mechanism of action of chemotherapeutic agents, radiation biology, carcinogenesis, regulatory processes in cells growing in culture, cytogenetics, and electron microscopy. Stipends are commensurate with training and experience. (Dr. Paul T. Condit, Head, Cancer Section, Oklahoma Medical Research Foundation, 825 Northeast 13 St., Oklahoma City 73104)